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Does Revenge Bedtime Procrastination Weaken the Benefits of Mindfulness on Well-Being?

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This study investigated the moderating role of revenge bedtime procrastination (RBP) in the relationship between mindfulness and subjective well-being (SWB) among Generation Z individuals in Jakarta, Indonesia. As this generation faces increasing pressure to maintain optimal performance in a digitally saturated environment, understanding factors that promote their SWB becomes crucial. A quantitative cross-sectional design was employed with 253 participants aged 13-28 years ($M = 20.50$, $SD = 2.29$), comprising 25.3% males and 74.7% females. Participants completed standardized measures including the Satisfaction With Life Scale, Cognitive and Affective Mindfulness Scale-Revised, and Bedtime Procrastination Scale. Statistical analyses were conducted using PLS-SEM, including item and instrument reliability tests, model fit evaluation, and bootstrapping procedures to examine the moderating role of RBP. Results revealed a significant positive relationship between mindfulness and SWB ($\beta = .289$, $p < .001$). At the same time, RBP demonstrated a significant negative relationship with SWB ($\beta = -.253$, $p < .001$). Critically, RBP significantly moderated the mindfulness-SWB relationship ($p < .05$), indicating that the beneficial effects of mindfulness on well-being are diminished when individuals engage in RBP. No significant differences were found in these relationships based on gender or age. The findings suggest that while mindfulness practices enhance SWB, their effectiveness may be compromised by maladaptive sleep behaviors that reflect poor self-regulation. These results have important implications for psychological interventions intended for Generation Z, suggesting that mindfulness-based programs should be integrated with sleep hygiene education and strategies to reduce bedtime procrastination.

Keywords: mindfulness, subjective well-being, revenge bedtime procrastination, Generation Z, moderation.

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INTRODUCTION

In the fast-paced dynamics of modern life, the pressure to sustain optimal performance has increasingly become a psychological burden, especially for Generation Z, who are currently in their most productive life phase (Curran & Hill, 2019; Livingstone, 2018). This generation has matured with a dynamic digital landscape, complicating the ability to maintain equilibrium between external demands and internal needs (Orben & Przybylski, 2019; Twenge & Campbell, 2018). Such an imbalance may adversely affect the core aspects of their lives, including subjective well-being (SWB). Accordingly, scholarly attention has intensified toward identifying and enhancing factors that promote SWB within this population (Diener et al., 2018).

To further explain the mechanisms underlying SWB, Self-Determination Theory (SDT) emphasizes that well-being is determined less by the quantity of motivation than by its quality. Autonomous motivation, which arises from the satisfaction of basic psychological needs for autonomy, competence, and relatedness, is consistently linked with higher levels of SWB. In contrast, controlled motivation is associated with need frustration and diminished well-being (McAnally & Hagger, 2024). Within this framework, mindfulness may function as a regulatory resource facilitating need satisfaction and enhancing SWB.

Mindfulness and Subjective Well-Being

One factor that has been extensively examined concerning improving SWB is mindfulness (Abdel-Hadi & Al-Quraan, 2024; Kaya & Odacı, 2024; Soldá de Souza et al., 2024; Tao et al., 2024). Mindfulness-based interventions, such as Mindfulness-Based Stress Reduction (MBSR), have demonstrated efficacy in improving emotional regulation, stress coping, and present-moment awareness (Kabat-Zinn, 1982). Empirical evidence also supports mindfulness as a buffer against procrastination and a predictor of higher SWB (Cheung & Ng, 2019; Rad et al., 2023; Schutte & del Pozo de Bolger, 2020). In other words, mindfulness has great potential to help individuals cope with daily stress while improving their overall quality of life. Although studies seem to support the role of mindfulness in SWB, challenges in an era of social media connectivity can make the relationship between these two variables unstable.

Revenge Bedtime Procrastination

One such factor is revenge bedtime procrastination (RBP), where individuals delay sleep to reclaim personal time, often spent on social media or digital entertainment, as a response to daytime stress or lack of leisure (Kroese et al., 2014). This maladaptive behavior has potentially significant consequences that cannot be ignored. RBP correlates with various negative impacts, such as daytime fatigue, decreased sleep

duration and quality, and impaired mental well-being (Carlson et al., 2023; Hill et al., 2024). While mindfulness fosters self-regulation (Tang et al., 2007), increases present-moment awareness (Zhang et al., 2024), and reduces procrastination (Sirois & Tosti, 2012), the habit of delaying sleep as a compensatory response to a lack of personal time may diminish these benefits. Thus, even with the adoption of mindfulness practices, the anticipated improvements in well-being may be suboptimal if RBP remains unaddressed.

This study investigates the effect of mindfulness on SWB among Generation Z adolescents and young adults in Jakarta, with RBP as a moderating variable, within the context of a digitally saturated and high-pressure environment.

Gender and Age as a Moderator

Individual differences such as gender and age may shape how these variables interact. Prior studies have shown that females tend to exhibit higher improvements in mindfulness, greater self-compassion, and stronger positive affect, which may influence how they benefit from mindfulness-based strategies (Bluth et al., 2017; Kang et al., 2018; Rojiani et al., 2017). Similarly, RBP is more prevalent among women (Herzog-Krzywoszanska & Krzywoszanski, 2019; Hidaka et al., 2020; Kroese et al., 2016; Magalhães et al., 2020). Gender differences in SWB are relatively small and shaped by factors such as social support, cultural context, employment status, and social roles (Jyothi et al., 2021; Meisenberg & Woodley, 2015; Song & Lee, 2022).

In parallel, developmental differences between adolescents and young adults may also influence mindfulness, RBP, and SWB. Research has found that older individuals often show higher mindfulness (Alispahic & Hasanbegovic-Anic, 2017; Boekel & Hsieh, 2018; Raes et al., 2015), while younger individuals are also more susceptible to bedtime procrastination (Miyagawa et al., 2024). SWB tends to change with age, often dipping in midlife and improving in older adulthood (Biermann et al., 2022; Mentus, 2022; Stone et al., 2020). From a developmental perspective, Erikson's psychosocial theory suggests that individuals in late adolescence and young adulthood face the psychosocial challenges of identity versus role confusion and intimacy versus isolation, which may influence how they manage stress, time, and well-being (Papalia & Martorell, 2021).

The Present Study

Given these findings and theoretical considerations, this study aims to investigate the contribution of mindfulness to SWB by examining the moderating role of RBP and further exploring whether this moderation differs across age and gender groups of Generation Z in Jakarta. Based on this conceptual basis, the present study proposes the following hypotheses: H₁: mindfulness positively affects SWB; H₂: RBP negatively affects SWB;

H₃: RBP moderates the mindfulness and SWB; H₄: the moderating effect of RBP on the relationship between mindfulness and SWB differs across gender; H₅: the moderating effect of RBP on the relationship between mindfulness and SWB varies by age.

METHOD

A total of 253 participants in Jakarta, aged 13 to 28 years ($M = 20.50$, $SD = 2.29$), completed the questionnaire conveniently, with 25.3% ($n = 64$) identified as male and 74.7% ($n = 189$) as female. Based on age classification, 25.3% ($n = 64$) were categorized as adolescents (13–19 years), and 74.7% ($n = 189$) as young adults (20–28 years), in line with definitions from the World Health Organization and Papalia & Martorell (2015). A convenience sampling strategy was employed due to the accessibility of participants within the study setting. While this approach enabled efficient data collection, it limits the sample's representativeness and, consequently, the generalizability of the findings.

Procedures

After gaining IRB approval from the Faculty of Psychology of Universitas Tarumanagara, data were collected through Google Forms, which included details on the study's objectives, instructions, and informed consent. Consenting participants proceeded to the survey questions. All instruments were translated using the forward translation method from English into Indonesian to ensure linguistic and cultural appropriateness for the target population.

Measurements

SWB was assessed using the Satisfaction With Life Scale (SWLS) (Diener et al., 1985). The SWLS consists of five items, such as "My living conditions are extraordinary," rated using a 7-point Likert scale with the following response categories: (1) Strongly disagree; (2) Disagree; (3) Slightly disagree; (4) Neutral; (5) Slightly agree; (6) Agree; and (7) Strongly agree.

Mindfulness was assessed using the Cognitive and Affective Mindfulness Scale-Revised (CAMS-R) (Feldman et al., 2007). This instrument comprises 12 items to capture mindfulness's cognitive and affective aspects. One example of the statements included is, "I find it easy to concentrate on what I am doing." Participants responded to each item using a 4-point Likert scale, with the following response options: (1) Rarely/never; (2) Sometimes; (3) Often; and (4) Almost always.

RBP was measured using the Bedtime Procrastination Scale (BPS) (Kroese et al., 2014). The BPS consists of nine items: "I go to bed later than the time I want." Participants responded to each item using a 5-point Likert scale with the following options: (1) Never; (2) Rarely; (3)

Sometimes; (4) Often; and (5) Always. All measurement instruments were translated, with content validity confirmed by expert judgment.

RESULTS

All variables met the criteria for convergent validity and reliability, with Cronbach's alpha values above .70 and AVE values exceeding .50. Mindfulness ($\alpha = .715$; AVE = .540), RBP ($\alpha = .735$; AVE = .558), and SWB ($\alpha = .857$; AVE = .639) met the criteria. Model fit was evaluated using the Standardized Root Mean Square Residual (SRMR), which yielded a value of .074. This indicated an acceptable fit model, as it fell below the accepted threshold of .08 (Hu & Bentler, 1999).

Hypothesis Testing

The bootstrapping method was used to test the first, second, and third hypotheses, without considering gender differences. As presented in Table 1, the first hypothesis was supported, indicating that mindfulness positively affects SWB ($\beta = .289$, $p < .001$). The finding suggests that individuals with higher levels of mindfulness tend to report greater levels of SWB. Additionally, the effect size for this relationship was small ($f^2 = .093$) (Cohen, 1988).

The second hypothesis, which states that RBP negatively affects SWB ($\beta = -.253$, $p < .05$) was supported, implying that higher levels of bedtime procrastination decrease SWB. The corresponding small effect ($f^2 = .072$) reflects a relatively modest impact. The third hypothesis, which posits that RBP moderates the relationship between mindfulness and SWB, was supported. However, the magnitude of this moderation was minimal, as indicated by a small effect size ($f^2 = .029$).

Table 1 Path Coefficients

No	Variables	Original Sample (<i>O</i>)	Sample Mean (<i>M</i>)	ST DEV	<i>T</i> statistics ($ O/STDEV $)	<i>P</i> values
1.	Mindfulness -> SWB	.289	.297	.061	4.765	.000**
2.	RBP -> SWB	-.253	-.258	.057	4.432	.000**
3.	RBP x Mindfulness -> SWB	.125	.124	.049	2.564	.010*

Note: $p < .05$ (*), $p < .01$ (**).

To examine the fourth and fifth hypotheses regarding the potential influence of gender and age groups on the research model, hypothesis testing was conducted using Bootstrapping Multi-Group Analysis (MGA). The results of the MGA are shown in Table 2, which indicates that gender did not significantly affect the study outcomes, and the hypothesized moderating role was rejected. Specifically, the analysis showed no significant difference between male and female participants in the moderating effect of RBP on the relationship between mindfulness and SWB ($p = .470$), suggesting that the moderating role of RBP on the mindfulness-SWB relationship is consistent across genders.

Table 2 Bootstrap Multigroup Analysis: Gender Differences

No	Variable	Difference (Female - Male)	1-tailed (Female vs Male) <i>p</i> value	2-tailed (Female vs Male) <i>p</i> value
1.	Mindfulness -> SWB	.137	.181	.362
2.	RBP -> SWB	.063	.318	.635
3.	RBP x Mindfulness -> SWB	-.079	.765	.470

The MGA results showed that age did not moderate the model, as no significant differences were found between adolescents and young adults across all tested paths ($ps = .29-.70$). These findings, as shown in Table 3, suggest that the structural paths in the model are consistent across developmental stages.

Table 3 Bootstrap Multigroup Analysis: Difference between Adolescents and Young Adults

No	Variable	Difference (Adolescents - Young adults)	1-tailed (Adolescents vs Young adults) <i>p-value</i>	2-tailed (Adolescents vs Young adults) <i>p-value</i>
1.	Mindfulness -> SWB	-.092	.646	.708
2.	RBP -> SWB	-.140	.885	.230
3.	RBP x Mindfulness -> SWB	.156	.148	.296

RBP : Revenge Bedtime Procrastination; SWB : Subjective Well-Being.

Model Predictive Relevance and Accuracy

Stone-Geisser's Q^2 value was calculated using the blindfolding procedure to evaluate predictive relevance. The predictive relevance assessment reveals that the model exhibits small predictive relevance on SWB ($Q^2 = .193$) with values greater than zero depicting prediction, and .02, .15, and .35 on the significance of small, medium, and large impacts, respectively. The model's predictive accuracy is also high, with the Root Mean Square Error (RMSE) = .903 and Mean Absolute Error (MAE) .727 = indicating that the model gives fairly good predictions of SWB (Hair et al., 2019).

Discriminant Validity Assessment (HTMT Criterion)

Based on the heterotrait-monotrait ratio of correlations (HTMT) results, all values were well below the conservative threshold of .85 (Hair et al., 2019), indicating that discriminant validity was established among Mindfulness, RBP, and SWB (HTMT = .478, .474, and .431, respectively). This means there is no evidence of problematic overlap between the constructs.

DISCUSSION

The present study identified a positive relationship between mindfulness and SWB. Although this relationship was statistically significant ($\beta = .289, p < .05$), the effect size was modest ($f^2 = .093$), suggesting that mindfulness, while beneficial, is not a dominant predictor of subjective well-being. This finding aligns with prior research demonstrating that mindfulness enhances SWB by fostering positive affect and life satisfaction while mitigating negative emotional states such as anxiety and depression (Ma & Xiang, 2023). Furthermore, students with elevated mindfulness levels report higher SWB, including in complex decision-making contexts, such as career planning (Arslan & Bayraktar-Uyar, 2020).

A growing body of evidence also supports the broader psychological benefits of mindfulness across student populations, with reported reductions in stress, loneliness, and anxiety contributing to greater overall well-being (Bamber & Morpeth, 2019; Bamber & Schneider, 2016; Bharti et al., 2023; Galante et al., 2018; Jin et al., 2020; Tao et al., 2024). Mindfulness has been positively linked to employee well-being across various occupational settings, highlighting its relevance for academic and professional mental health interventions (Sawal, 2023; Yang et al., 2022). Existing studies suggest that mindfulness is a valuable, though modest, predictor of SWB (da Silva et al., 2023; Hepburn et al., 2021; Kosugi et al., 2021). Taken together, the evidence underscores the positive role of

mindfulness in fostering SWB, while also highlighting the need to consider additional contextual factors that may affect this relationship.

In contrast, RBP showed a significant negative relationship with SWB ($\beta = -.253, p < .05$). Similar to mindfulness, however, the effect size was relatively small ($f^2 = .072$), implying that while higher RBP corresponds with reduced well-being, the association is comparatively weak. Previous studies have linked bedtime procrastination to poor sleep quality, which in turn may increase stress, depression, anxiety, and insomnia while reducing overall well-being (Chung et al., 2019; Dardara & Al-Makhalid, 2021). Bedtime procrastination is associated with both insufficient sleep quantity and quality, adversely impacting mental and physical health (Kroese et al., 2014). Additional recent studies have similarly found that bedtime procrastination predicts a range of negative sleep-related outcomes, which may indirectly diminish subjective well-being, with reported effect sizes ranging from small to moderate (Carlson et al., 2023; Hill et al., 2022).

Furthermore, RBP was found to moderate the relationship between mindfulness and SWB. Although this interaction reached statistical significance ($p < .05$), the corresponding effect size was small ($f^2 = .029$). This suggests that the positive effects of mindfulness on SWB are not absolute but vary depending on the level of RBP. Individuals with high mindfulness and RBP may experience diminished benefits, while those with low RBP may experience more optimal outcomes. In this context, RBP emerges as a potential psychological barrier that limits the efficacy of mindfulness interventions.

Although research examining RBP as a moderator in the mindfulness-SWB relationship remains limited, the Self-Determination Theory (SDT) framework provides a valuable lens for interpretation. Mindfulness has been shown to foster self-awareness and autonomous self-regulation (Deci et al., 2015; Kabat-Zinn, 1982). Within the SDT framework, mindfulness supports intrinsic motivation and psychological growth, both conducive to well-being. However, RBP reflects a breakdown in self-regulation, where individuals sacrifice rest for short-term gratification, often as a compensatory response to daytime stress or limited leisure time (Kroese et al., 2014; Nauts et al., 2019). While mindfulness aims to build conscious awareness and regulation, its benefits may be undermined if individuals remain caught in cycles of RBP. These findings suggest that mindfulness alone may be insufficient unless accompanied by strategies to reduce RBP and improve sleep hygiene.

Neither gender ($p = .47$) nor age ($p = .29$) significantly influenced mindfulness, RBP, or SWB, consistent with prior findings (Batz-Barbarich et al., 2018; Fuentes et al., 2022; Jyothi et al., 2021; Lee et al., 2023; Shawky & Shaheen, 2024; Shukla & Andrade, 2023; Chi et al., 2018; Gurven et al., 2024; Khou et al., 2024; Tan & Martin, 2012).

Despite small effect sizes and limited moderation effects that have a restricted implication in practice, the results have significant implications

for interventions focused on Generation Z in Jakarta. SWB programs that foster mindfulness should include measures to improve sleep hygiene and reduce bedtime procrastination strategies, such as time management, training in self-regulation, and psychoeducation. In addition to personal strategies, institutional policies fostering healthier habits can help sustain healthy psychology.

Limitations of the Study

Despite its contributions, this study has several limitations. All data were collected using self-report questionnaires, which were prone to biases such as social desirability, recall inaccuracies, and the lack of objective measures, reducing the precision of findings, especially regarding sleep behavior and emotional states. The sample was limited to adolescents and young adults from Jakarta, potentially limiting generalizability across Generation Z due to unaccounted factors like socioeconomic background, education, and life stage. The cross-sectional design further restricts the ability to draw causal conclusions among mindfulness, RBP, and SWB, leaving the temporal direction of these relationships unclear. Additionally, the study did not consider other relevant psychological factors, such as self-compassion, emotion regulation, or perceived control over time, that may influence the results, nor did it examine the cognitive-emotional mechanisms underlying RBP. Lastly, while mindfulness was shown to have positive effects, the study did not investigate whether specific components like absorption or flow might paradoxically delay sleep due to distorted time perception, suggesting possible unintended effects not captured in the current design.

Recommendations for Future Research

This study contributes to understanding mindfulness, RBP, and SWB within adolescence and young adults in Jakarta. However, several avenues for future inquiry emerged during our analyses. Future research should prioritize integrating multi-methodological approaches to deepen insights beyond self-report data.

Employing objective measures such as actigraphy for sleep duration and quality, or physiological measures for stress, could provide a more robust and less biased assessment of RBP and its impact on well-being. Furthermore, qualitative methodologies, such as in-depth interviews or focus groups, would be invaluable for uncovering the nuanced cognitive and emotional mechanisms that drive RBP, especially across different psychological profiles within Generation Z. Such approaches could illuminate the specific "revenge" motivations and the subjective experiences of time distortion in highly mindful individuals.

To improve the generalizability of findings, subsequent studies should recruit broader and more demographically diverse samples of Generation Z. This includes participants from various educational backgrounds, socioeconomic levels, and marital statuses. Expanding the sample to include individuals across different life stages, such as those entering the workforce or starting families, would offer a more comprehensive understanding of how mindfulness, RBP, and SWB interact in varied real-world contexts and under different life demands.

In conclusion, while this study confirms the positive influence of mindfulness on SWB and highlights RBP as a significant impediment, it also underscores the complexity of these interactions. By adopting more varied methodologies and broader samples, future research could provide more actionable insights for developing targeted psychological interventions that empower Generation Z to cultivate healthier sleep patterns and enhance their overall well-being.

Competing interest

The authors declare no conflicts of interest.

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